New Directions in Production and Inspection

by

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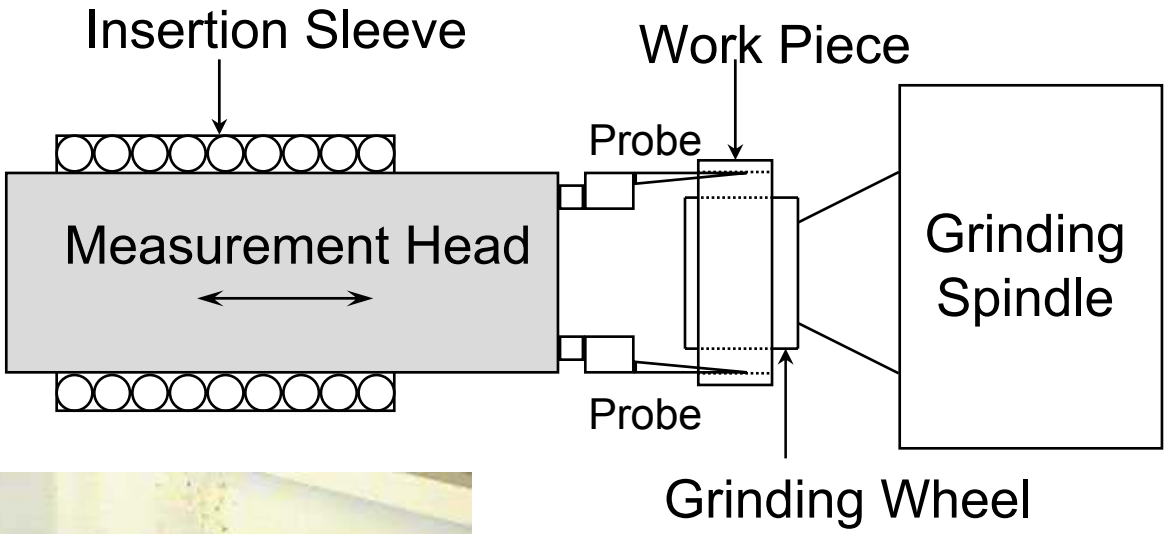
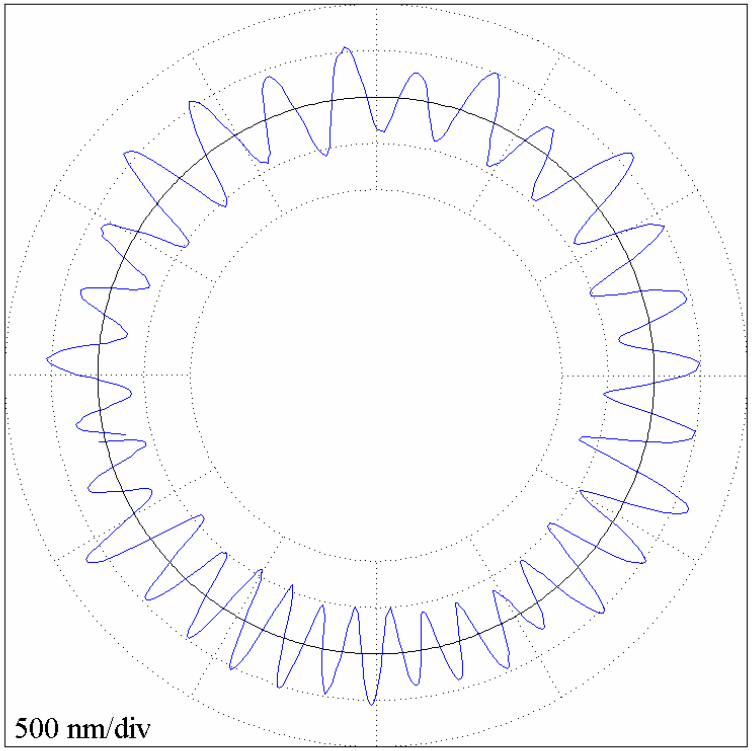
An Old Sensor a New Use



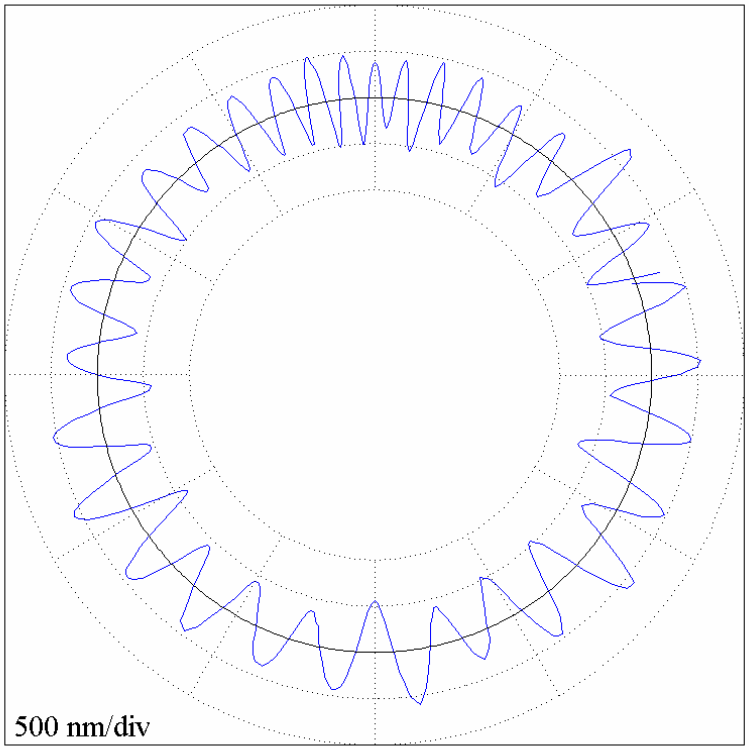
Real-Time Measurement

Probe 1



10 UPR High-Pass Filter

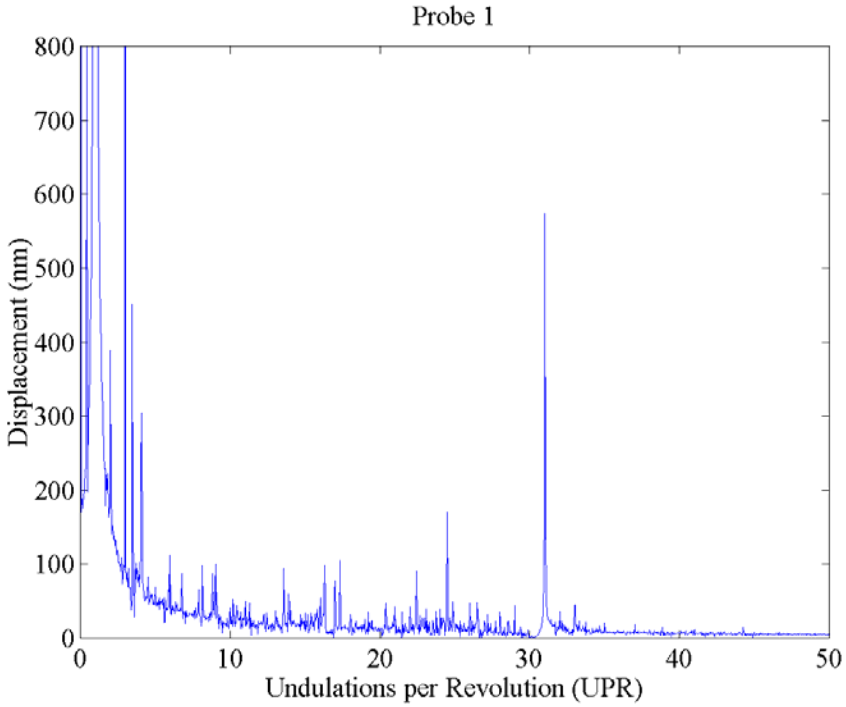
Probe 2

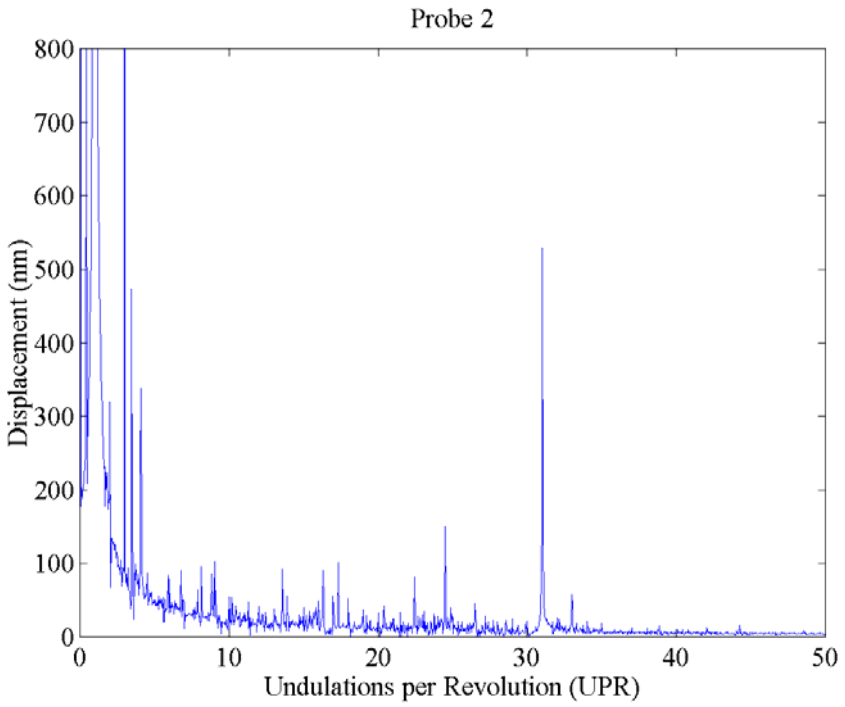


10 UPR High-Pass Filter

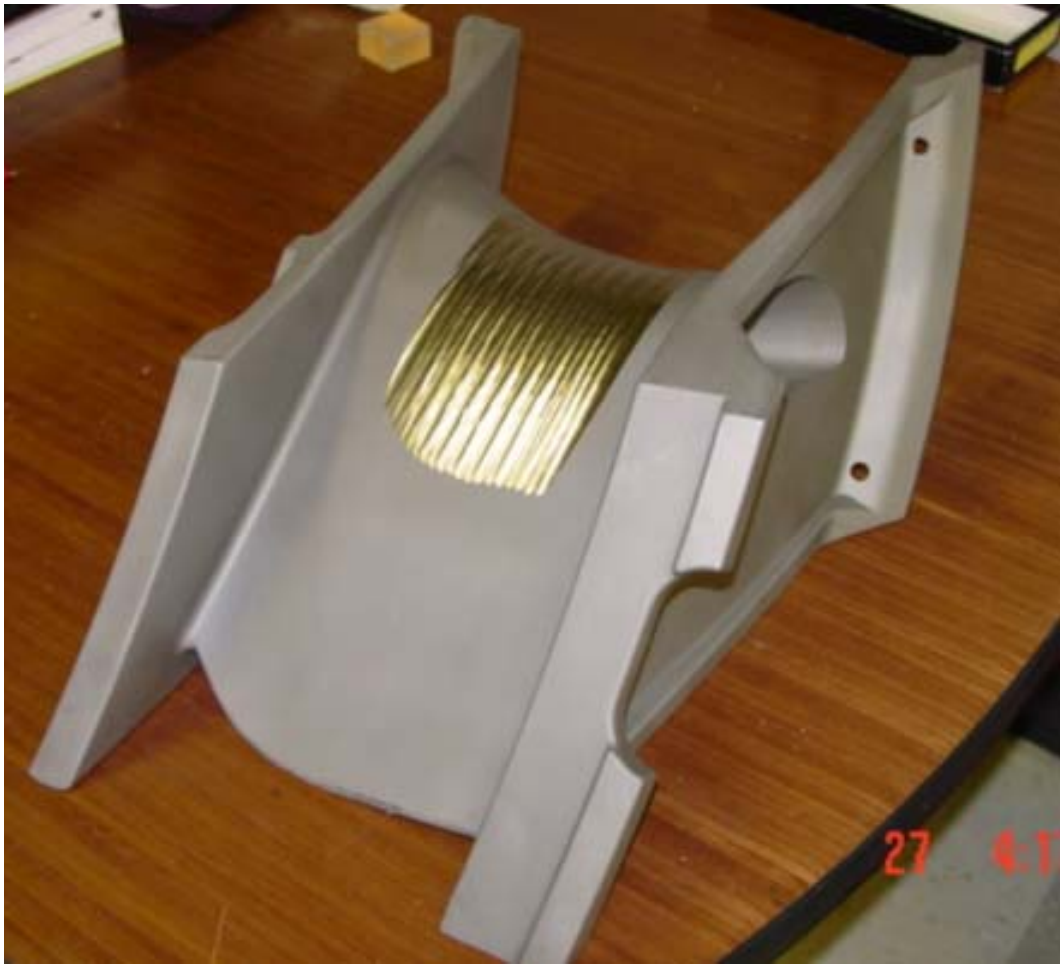
Real-Time Frequency Analysis

- 31 UPR Indicating High Frequency Chatter.



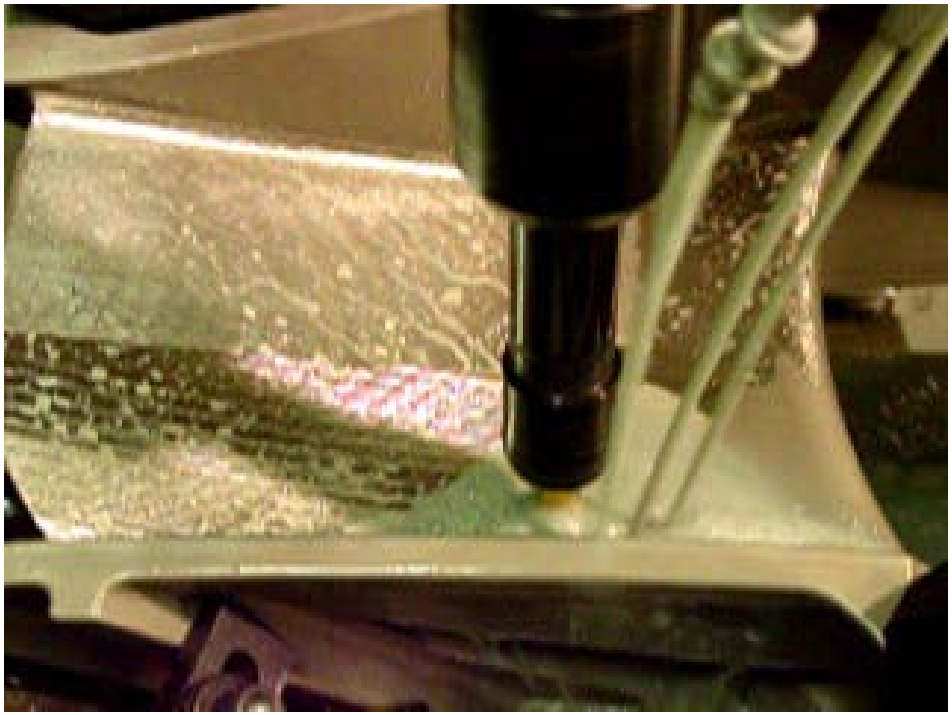


Part – Turbine Nozzle Segment



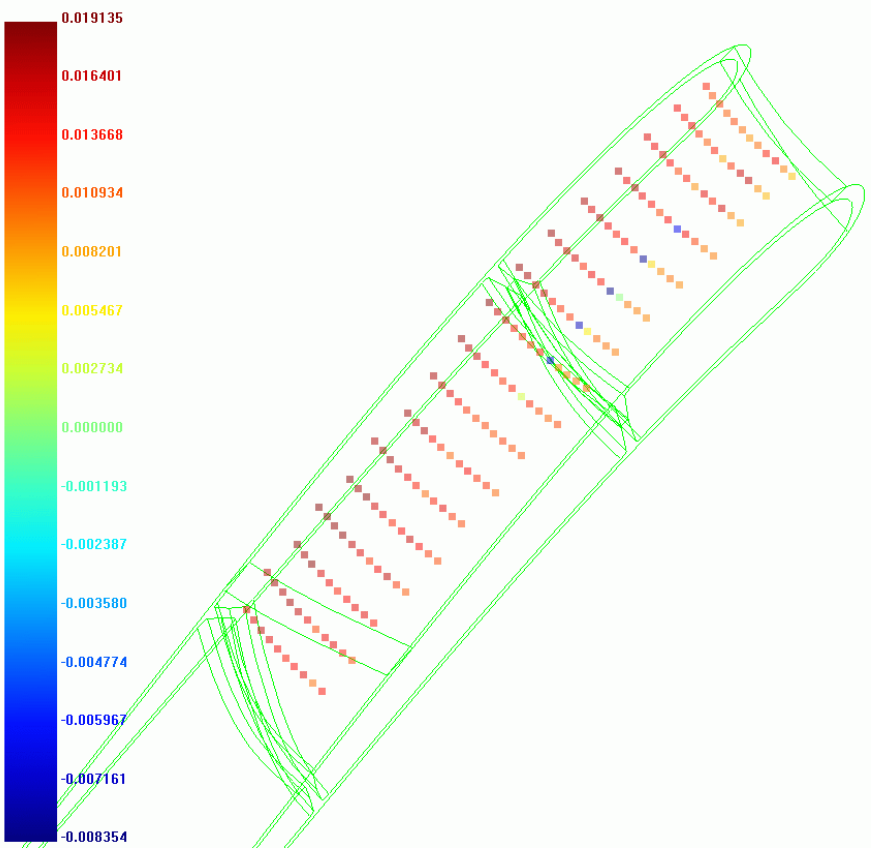
Fadal VMC15 Machining Center

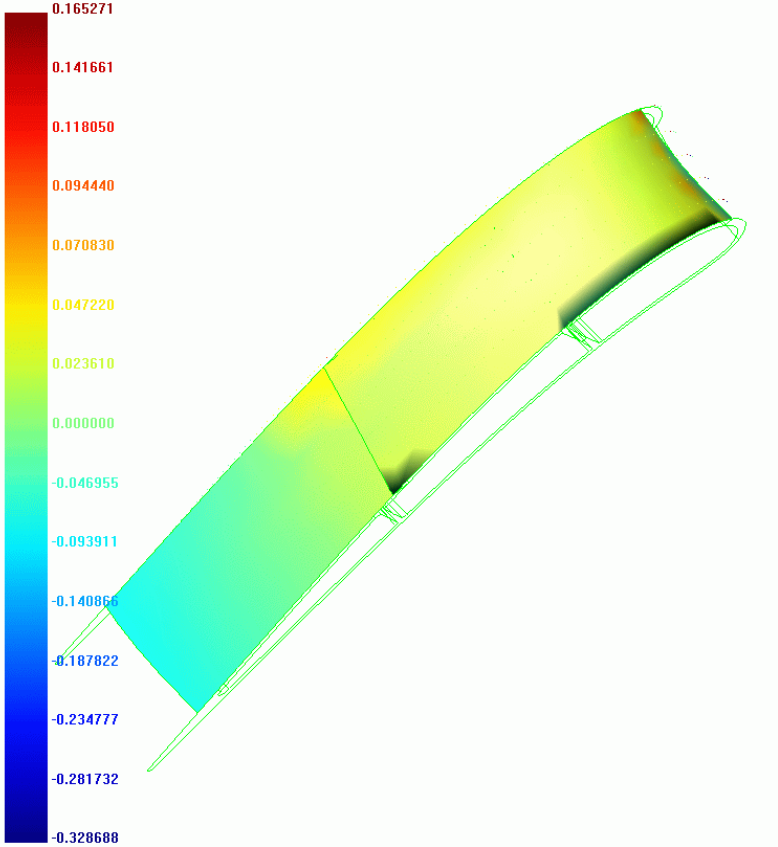
Machining



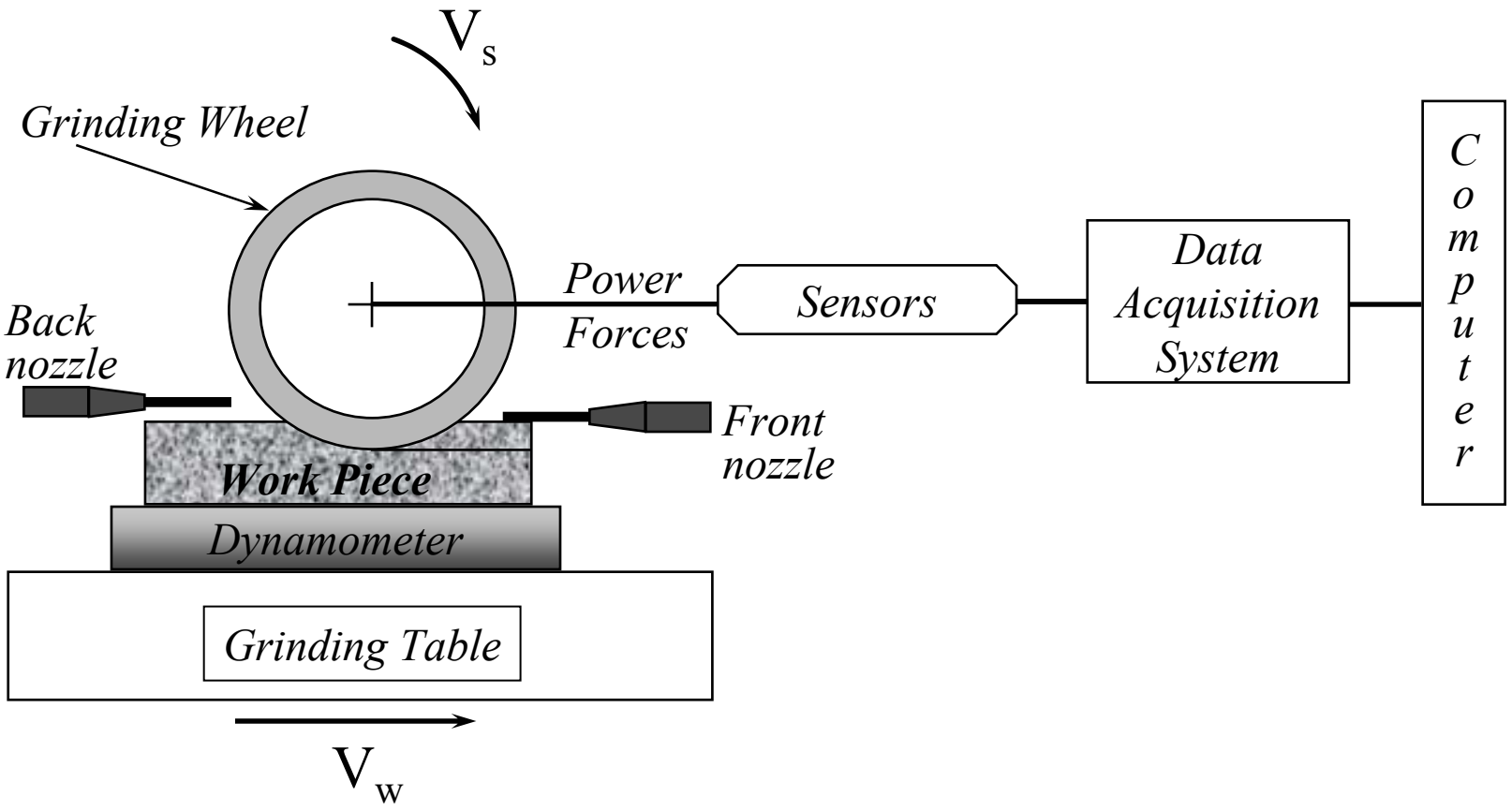
Inspection

Turbine Nozzle - Results

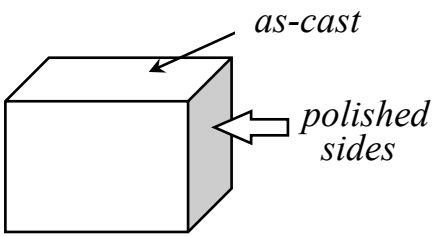


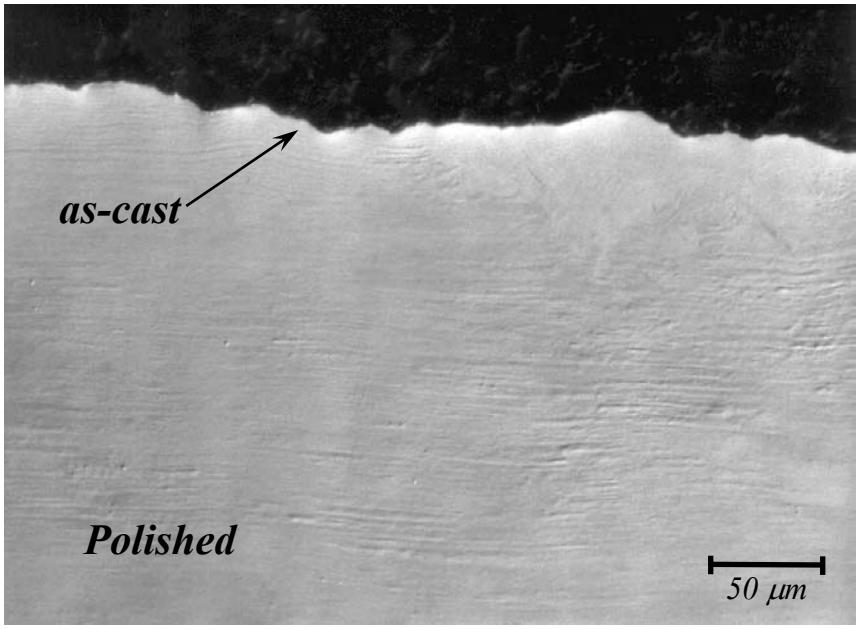


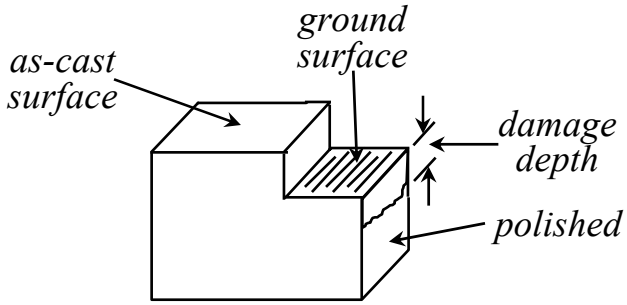
Controlling a Different Parameter - Subsurface Damage (Ti-Al γ)

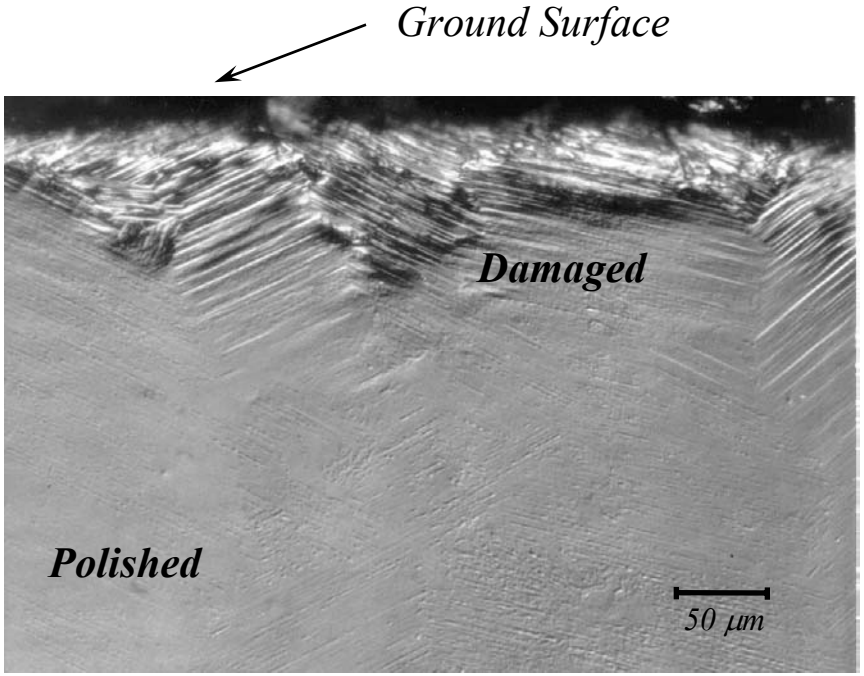


Subsurface Damage



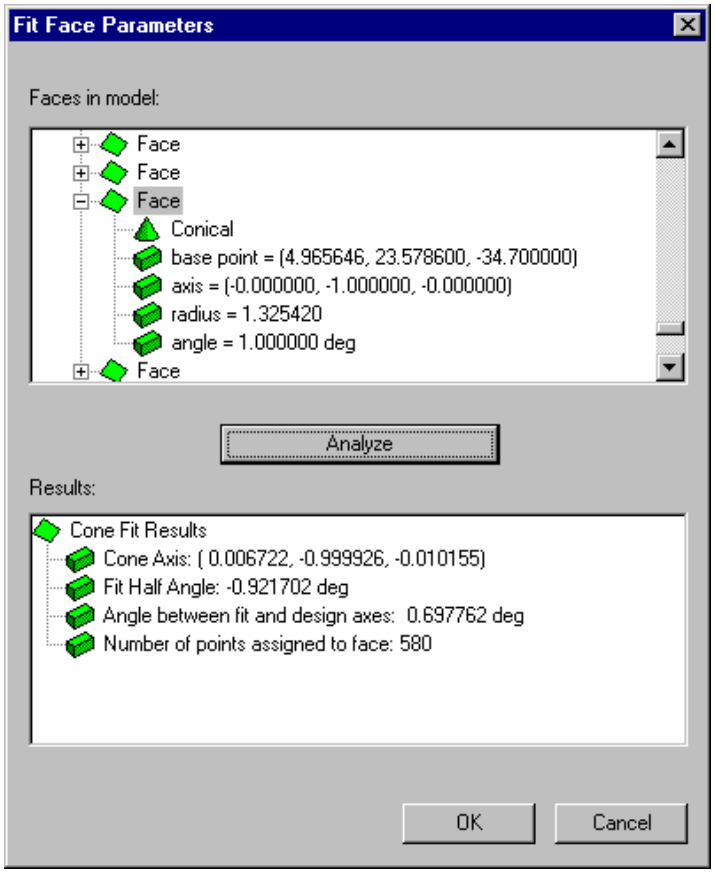


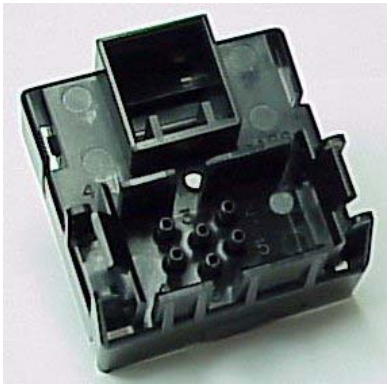


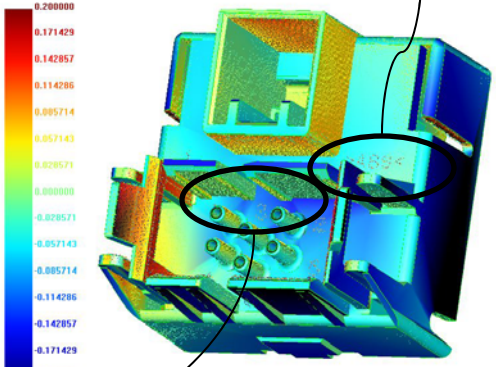


V_s=30 m/s, V_w=0.5 m/min, a=25 μm

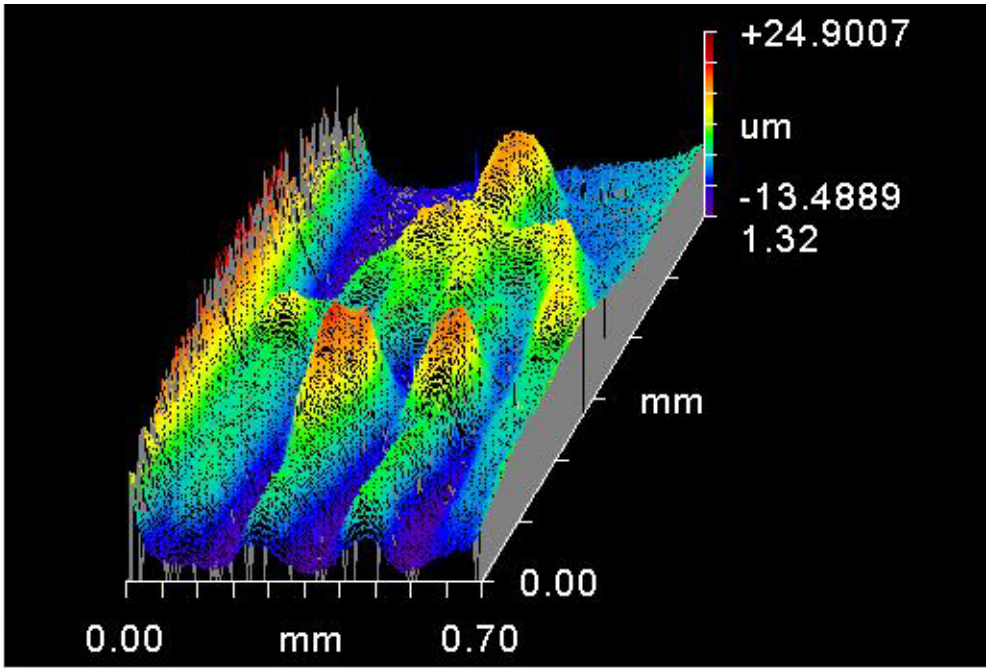
Deviations from Target and Analytics





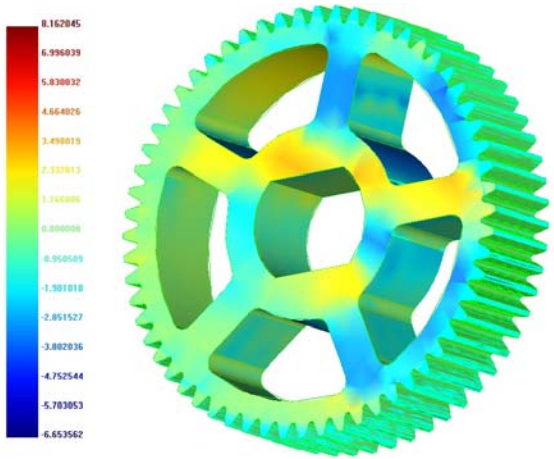


Micro-Metrology - A Penny

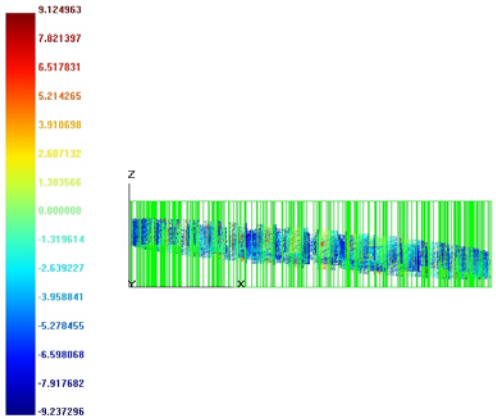


Micro-Gear Analysis – Thinking Small

- Microtoming



- Tomography

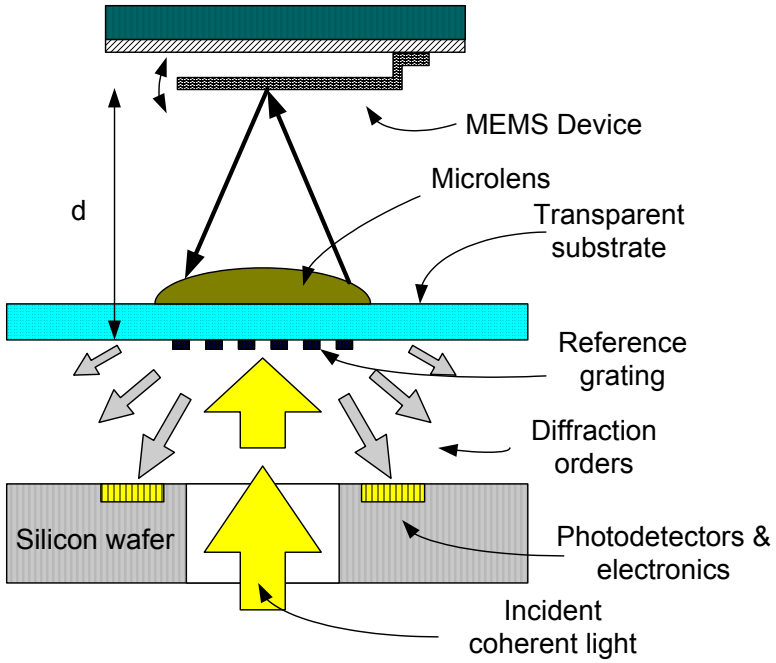


Georgia Tech

Sandia National Laboratories

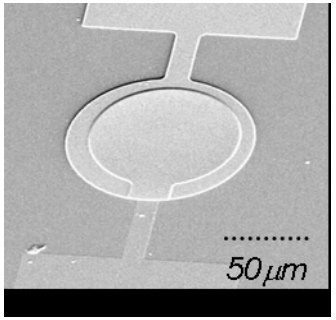
Approach: Micro-Fabricated Position Sensing Grating Interferometer

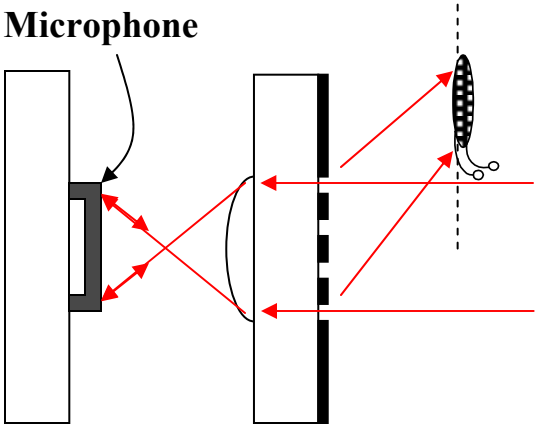
- Based on intensity measurement of the diffraction pattern created by a grating and microlens
- Better resolution at focus
- Compact design.

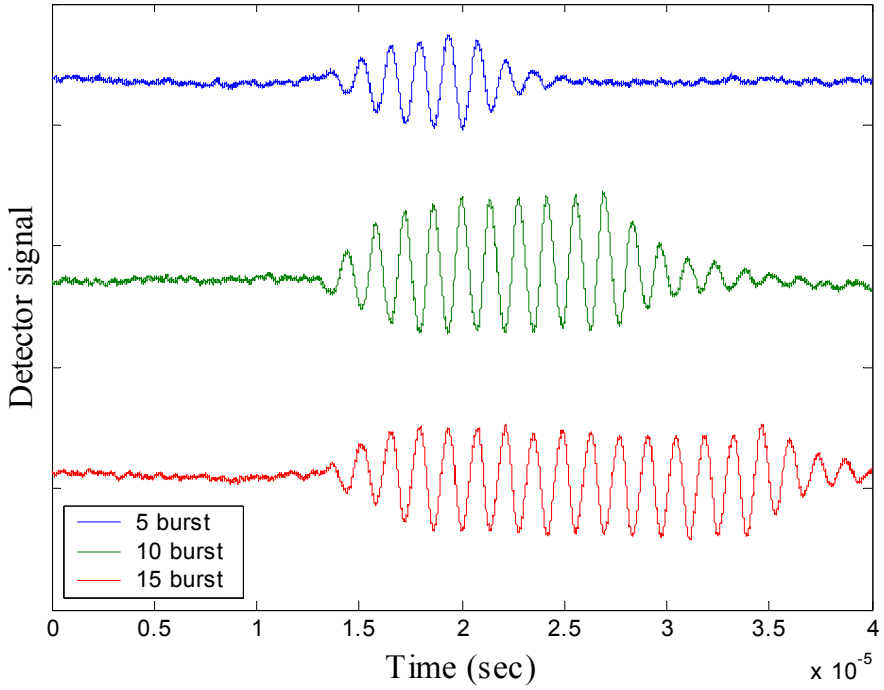


Dynamic Measurement.

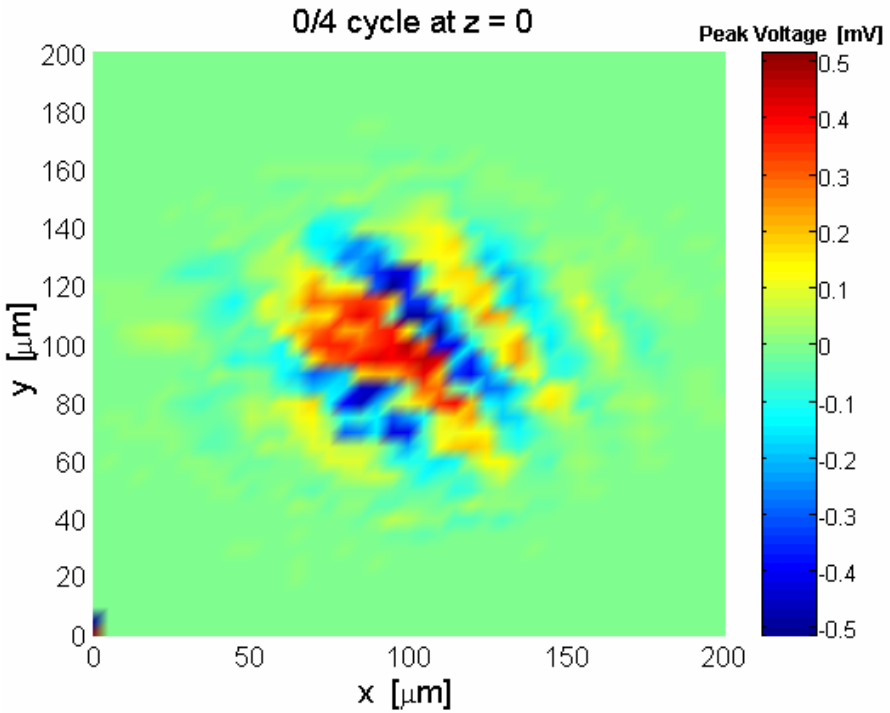
- MEMS Microphone
  - 160 μm diameter
  - Electrostatic actuated at 726 kHz by 100V(DC)±16V(AC)
  - 5,10,15 burst
- Detector signal
  - 720kHz≈10cycles/1.39x10-5 sec
  - Shows ringing.







Imaging at Focal Plane (z=0)



Optoelectronics Integration

- Flexible grating fingers
- Integration of electronics

- Fabrication of detector array
  - 1 mm pitch
  - 300 μm x 300 μm and
  - 100 μm x 100 μm.